

Exhibit 2

CENTRAL FILES

JUN 10 1977

Misslake L. J.
 MC007990013
 7.2

Mrs. Carolyn Ashford
 Director, Missouri Department
 of Natural Resources
 P.O. Box 1363
 Jefferson City, MO 65101

Dear Mrs. Ashford:

This refers to a special investigation conducted by this office to obtain information pertaining to the disposal of natural uranium ore residues in a St. Louis County landfill area by the Cotter Corporation during 1973. This also refers to the discussions held with Messrs. K. V. Miller and G. MacNutt of the State of Missouri Bureau of Radiological Health in St. Louis on June 6 and 7, 1977, at which time a copy of our investigation report was furnished to them. Although there were no items of noncompliance with NRC requirements found during this investigation, the NRC believes that a more detailed environmental evaluation of these sites should be conducted.

As discussed with Messrs. Miller and MacNutt, the Nuclear Regulatory Commission has arranged for the Oak Ridge National Laboratory to perform such a survey at the St. Louis landfill site, as well as at the property formerly occupied by the Cotter Corporation. You will be kept fully informed of the results of that survey.

Sincerely,

James G. Keppler
 Director

cc: Jarboe Realty and
 Investment Company
 Norfolk and Western Railroad

cc w/IE Investigation Report No. 76-01
 Cotter Corporation
 ✓ Central Files
 Reproduction Unit NRC 20b
 PDR
 NSIC



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 SUPERFUND RECORDS

OFFICE →	RIII	RIII	RIII	RIII	
SURNAME →	Pagliari/bk	Allan	Norelius	Keppler	
DATE →	6/10/77				

UNITED STATES NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION III

IE Investigation Report No. 76-01

Subject: Cotter Corporation
Hazelwood, Missouri
License No. SUB-1022 (Terminated)

Allegations regarding the disposal of uranium
ore residues were partially substantiated.

Period of Investigation: June 22-24, and August 11, 1976

Investigators:

G. A. Phillip
(6/22-24/76)

1-4-77
(Date)

W. B. Grant
(6/22-24/76 and 8/11/76)

1-4-77
(Date)

A. G. Januska
(8/11/76)

1/4/77
(Date)

B. L. Jorgensen

1/4/77
(Date)

Reviewed By:

G. T. Lonergan
G. T. Lonergan, Chief
Materials Radiological
Protection Section

1/5/77
(Date)

J. A. Pagliaro
J. A. Pagliaro, Chief
Environmental and Special
Projects Section
(10/20/76)

1/5/77
(Date)

REASON FOR INVESTIGATION

Following receipt of a letter dated June 2, 1976, from the Missouri Department of Natural Resources, forwarding newspaper articles containing allegations regarding the disposal of uranium ore residues, Region III initiated an investigation.

SUMMARY OF FACTS

A report on an inspection conducted by Region III on April 10 and 21-24, 1974,^{1/} stated that according to licensee representatives the stockpile of the source material previously stored by Cotter Corporation under License No. SUB-1022 at 9200 Latty Avenue, Hazelwood, Missouri, had been shipped to its facilities in Canon City, Colorado by mid-1973 with the exception of 8700 tons of leached barium sulfate. The report further states: "Records maintained by Cotter Corporation showed that this material contained from 0.05% to 0.1% or approximately 7 tons of uranium as U_3O_8 . Licensee representatives stated, and records of invoices paid to B&K Construction Company show, that this material along with approximately 38,000 to 39,000 tons of soil removed from the top 12 to 18 inches of the Latty Avenue site was disposed of in St. Louis County sanitary landfill area No. 1 on Old Bridge Road over the period July 31 through October 12, 1973." The report further states: "This material was hauled to the landfill area and used as cover for part of the several hundred truckloads of garbage and refuse that are shipped to the landfill area site every week. The licensee estimates that the barium sulfate is probably buried under 100 feet of garbage at this time. The trucks were hosed out after hauling this material."

Subsequently, on November 13, 1974, in response to a request from Cotter Corporation, License No. SUB-1022 was terminated.

By letter dated June 2, 1976, the Director, Division of Environmental Quality, Missouri Department of Natural Resources, sent copies of news articles appearing on May 30 and June 1, 1976 in the St. Louis Post-Dispatch which indicated that the information in the inspection report was inaccurate. Specifically, the news articles indicated that:

- a) Only 9 tons of waste rather than nearly 40,000 tons of waste and soil had been moved from the Latty Avenue site.
- b) The material was dumped at West Lake Landfill rather than St. Louis County landfill No. 1.

In his letter the Director, Division of Environmental Quality, stated that the depth at which the material was reportedly buried must be

^{1/} RO Inspection Report No. 040-8035/74-01.

incorrect since no St. Louis area landfills contained 100 feet of fill.

It was ascertained that:

- a. During the period July 16 to October 9, 1973, over 43,000 tons of waste and soil were removed from the Latty Avenue site.
- b. The 43,000 tons of waste and soil were dumped at the West Lake Landfill.
- c. The material dumped at West Lake Landfill is covered by about 3 feet of other soil.

The inaccurate information in Inspection Report No. 040-8035/74-01 regarding the identification and location of the landfill area apparently resulted from miscommunication between the inspector and the B&K Construction Company representative. The erroneous information regarding the depth at which the residue was reportedly buried was based upon information furnished by the licensee who expressed this offhand opinion.

Environmental samples were taken and beta-gamma surveys were made at the Latty Avenue and West Lake Landfill sites on August 11, 1976. The Latty Avenue site and environs was revisited on October 20, 1976, for additional environmental samples and alpha, beta-gamma direct surveys. The report for the October 20, 1976 visit appears as Attachment D in this report. The Latty Avenue environmental samples confirm the removal of the bulk of materials but show that some residues remain. The Latty Avenue surveys showed radiation levels exceeding NRC criteria for decontamination of land areas prior to return to unrestricted use. The West Lake Landfill surveys indicated that radioactive material is buried there, and one environmental sample showed a slightly elevated natural uranium concentration. Based on the direct radiation surveys, neither site presents an immediate radiological health hazard to the public.

For the environmental transport pathways evaluated, a hazard analysis indicates that the material disposed of at the West Lake Landfill does not pose any immediate hazard to the public presuming the presence of 7 tons of natural uranium.

Solubility tests of the soil samples were not conducted, however, U_3O_8 combined with barium sulfate is known to be insoluble in water. Groundwater was not available for sampling at the West Lake Landfill site. A sediment and surface water sample was taken from a creek near the Latty Avenue site.

No items of noncompliance were identified during this investigation.

SCOPE OF INVESTIGATION

This investigation was conducted to determine the circumstances relating to the disposition of about 8700 tons of leached barium sulfate from the former licensee's facility at Hazelwood, Missouri and consisted of a review of pertinent records, independent sampling and measurements and interviews of individuals.

CONCLUSIONS

1. About 8700 tons of leached barium sulfate containing about 7 tons of U_3O_8 were mixed with about 39,000 tons of soil at the Latty Avenue site as reported by the licensee during the April, 1974 inspection. The residue-soil mixture was transported to the West Lake Landfill area in St. Louis County where it is covered by approximately 3 feet of other soils instead of 100 feet as reported by the licensee during the April, 1974 inspection.
2. Environmental soil samples indicate the continuing presence of some uranium and thorium ore process residues at the Latty Avenue site. Beta-gamma surveys performed by IE:III personnel at that site on August 11 and October 20, 1976, indicate levels of direct radiation exceeding the criteria established by NRC for decontamination of land areas prior to release for unrestricted use. Further, these levels were found to be greater than those reported by the licensee in his application for termination of the license dated May 10, 1974.
3. Based on direct radiation measurements of the material present at the West Lake Landfill and at the Latty Avenue site, neither location presents an immediate direct radiation health hazard to the public.
4. It is estimated, using uniformly conservative assumptions, that the concentration of natural uranium in the West Lake Landfill could result in increased airborne concentrations of radon 222 and its progeny, directly over buried materials, of about one-half of the 10 CFR 20 limits for unrestricted areas.
5. It is known that significant increases in indoor radon 222 concentrations can be experienced in dwellings built in or on disposed tailings. Physical and chemical differences between tailings materials, however, prohibit a direct comparison between what might occur in dwellings constructed in the West Lake Landfill as against the results of previous studies. A complete environmental impact analysis, specific to the materials at the landfill, should be performed to quantify the potential for radon buildup in dwellings built at the landfill.

DETAILS

Introduction

By letter dated June 2, 1976, Mr. Kenneth M. Karch, Director, Division of Environmental Quality, Missouri Department of Natural Resources, forwarded to Region III copies of articles published in the St. Louis Post-Dispatch on May 30 and June 1, 1976 which he stated in his letter ". . . presented evidence that some seven tons of uranium were dumped in 1973 at the West Lake Landfill in St. Louis County by an Atomic Energy Commission subcontractor removing radioactive waste material from a site in Hazelwood, Missouri." Mr. Karch stated in his letter that: "The investigation by the Post-Dispatch indicates that AEC did not know the correct location of the dumping, the local geology, nor the actual concentration of uranium dumped. The depth cited must also be incorrect since no landfills in the St. Louis area contained 100 feet of fill." A copy of Mr. Karch's letter with news articles attached is attached to this report as Exhibit A.

By letter dated June 17, 1976, Region III responded to Mr. Karch pointing out that Cotter Corporation, which was responsible for the burial, was an AEC licensee, not an AEC subcontractor and advising him, therefore, that the matter would be investigated by NRC. A copy of Region III's letter is attached to this report as Exhibit B.

Background

In early 1966 the Continental Mining and Milling Company, Chicago, Illinois, purchased from the Atomic Energy Commission ore residues which were stored at the St. Louis Airport. The material was moved from that site during 1966 to the 9200 Latty Avenue, Hazelwood, Missouri site. Continental Mining and Milling Company possessed License No. SMA-862 for this program. In January 1967 the Commercial Discount Corporation of Chicago, Illinois took physical possession of the stockpile. License No. SMC-907 was issued to Commercial Discount Corporation on December 29, 1966 allowing possession of the residues, removal of moisture and shipment to the Cotter Corporation facilities in Canon City, Colorado. In December 1969 the remaining source material was sold to Cotter Corporation who obtained License No. SUB-1022 dated December 31, 1969. The AEC's invitation to bid listed the following residues for purchase: 74,000 tons of Belgium Congo pitchblende raffinate containing about 113 tons of uranium; 32,500 tons of Colorado raffinate containing about 48 tons of uranium; and 8700 tons of leached barium sulfate containing about 7 tons of uranium.

In August 1970, Cotter Corporation began drying and shipping the remaining residues from the St. Louis site to their mill in Canon City, Colorado at the rate of about 400 dry tons of material per day. This operation was performed for Cotter Corporation by B&K Construction

Company and continued until about November 1970. During the August to November period, all of the residues were shipped to Canon City with the exception of approximately 10,000 tons of Colorado raffinate and 8700 tons of leached barium sulfate. There was no further activity at the Latty Avenue site until mid-1973.

During an inspection conducted in April 1974, a Region III inspector was informed that during the period July-October 1973, the remaining Colorado raffinate was shipped to Canon City without drying and the leached barium sulfate along with 38,000 to 39,000 tons of soil had been disposed of in a landfill area in St. Louis County. The leached barium sulfate contained from 0.05% to 0.1% uranium as U_3O_8 . Twelve (12) to eighteen (18) inches of the topsoil was stripped from the Latty Avenue site and disposed of with the leached barium sulfate.

Visit to Cotter Corporation, Lakewood, Colorado

On June 22, 1976, the following information was obtained during a visit to the Cotter Corporation, Lakewood, Colorado offices. Mr. David P. Marcott, Executive Vice President of Cotter Corporation, stated that all of the source material once stockpiled at the Latty Avenue site had been shipped by rail to its facility in Canon City, Colorado, except the approximate 8700 tons of leached barium sulfate. The material had very low concentrations of uranium, from 0.05% to 0.1%, and it was considered commercially impractical to further process this material to remove the uranium. He indicated that it would be necessary to process the material with several hundred pounds of hydrochloric acid to leach a pound of uranium from each ton of the barium sulfate. If the uranium could be leached out using water the licensee would certainly have processed the material rather than disposing of it. He indicated that for this reason he was confident that the uranium remaining in the leached barium sulfate now located in a landfill would not leach out into the groundwater. He said that the average uranium content of ore currently being processed by the mining industry was 0.16% which is greater than that disposed of in the St. Louis area. He indicated that some ore being processed by Cotter Corporation contains 0.65% uranium. He indicated that in his opinion the uranium contained in the leached barium sulfate did not constitute any threat to the environment wherever it is now located.

Marcott further advised that he visited the site on more than one occasion in 1973. He indicated that on one occasion Mr. Robert Davis of B&K Construction Company drove him around the area and pointed out to him the landfill area where the material would be dumped. He said he could not recall the name or location of the area. It was his recollection that the landfill area had a large deep pit. It was on this basis that he had expressed the opinion that the material was probably buried under 100 feet of soil and garbage. He indicated that he also visited the Latty Avenue site on another occasion and personally saw the trucks removing the dirt from the premises.

Marcott stated that B&K supplied weight sheets along with the invoices submitted for payment for disposing of the barium sulfate and dirt from the Latty Avenue site. These invoices also included charges for the Colorado raffinate shipped by rail to Canon City during the same period of time.

Mr. Duane A. Dughman, Vice President-Finance of Cotter Corporation, provided copies of 11 invoices for the period July to October 1973. These invoices showed a total of 48,544.70 tons of material were trucked to a disposal site which is not identified on the invoices. The invoices also showed that 10,763.41 tons of material were shipped by rail during the same period.

Dughman stated that he had reviewed all related records in Cotter's files and none of them identified the landfill area to which B&K Construction had taken the material. Dughman stated that the only papers relating to the Latty Avenue site not contained in the master files in the Lakewood, Colorado offices were the weight sheets that had accompanied B&K's invoices. He indicated that these had been retained at the Canon City facility. He made an inquiry by telephone of personnel at the Canon City facility concerning the weight sheets and was advised that they couldn't be located. It was indicated that Mr. Warren Goff, who was away and not scheduled to return for several days, was the only one who could locate them.

Copies of the 11 invoices were obtained and copies of them, with the cost entries deleted, are attached to this report as Exhibit C.

Visit to West Lake Landfill, Bridgeton, Missouri

On June 23, 1976, the following information was obtained from Mr. Vernon Fehr, Superintendent of Plant No. 1 West Lake Landfill.

Fehr indicated that he recalled that about three years ago, B&K Construction Company had dumped what he understood to be clean fill in an area adjacent to the office building. He indicated that he had seen the material being dumped and it looked like ordinary dirt to him. Since clean landfill is useful as cover, there is no charge for dumping it and no records are maintained of its receipt. It was his recollection that the dumping of the material did not involve any formal arrangements. The truck drivers just came to the site and he told them where to dump it. He stated that he could identify the specific location where the material was dumped and estimated that it was three feet down. While he recalled that a large quantity of material was dumped, he was somewhat doubtful that it totalled 39,000 tons.

Fehr advised that in 1974 the Missouri Department of Natural Resources advised West Lake to discontinue dumping in two areas on the site, one of those being the area where the B&K material was located. He indicated that this area was full anyway. He went on to say that the State required them to sink wells around the area so that samples of the groundwater could be obtained. He indicated that the State

obtained and analyzed groundwater samples from the wells and did not report any problems regarding their findings. He said the wells are still there.

Telephone Contacts with Ryckman, Edgerley, Tomlinson & Associates,
St. Louis Missouri

On June 23, 1976, telephone contacts were made with Dr. E. Edgerley and with Mr. Phillip K. Feeney of Ryckman, Edgerley, Tomlinson & Associates, an environmental engineering firm that provided consultant services to Cotter Corporation on health physics and site decontamination.

Dr. Edgerley stated that while he had visited the Cotter Corporation Latty Avenue site when the residues were being dried and shipped to Canon City, Colorado, he had no personal knowledge concerning the disposal of the material remaining onsite after these operations were discontinued.

Mr. Feeney stated that he was aware that the topsoil was stripped from the Latty Avenue site and trucked to a landfill but he did not know which one. He indicated that arrangements regarding the disposal operations were made directly between Cotter Corporation and B&K Construction Company. Feeney stated that he visited the site to perform a termination survey after being informed that the disposal operations were completed. During the first survey he made he found one small spot above 0.6 mR/hr. He instructed B&K to remove some dirt from this area which he indicated would be a truckload or less. Subsequently, he returned to the site and found less than 0.1 mR/hr. By letter dated May, 1974, the results of Feeney's survey were furnished to Cotter Corporation. A copy of this letter with its attachments appears as Exhibit D in this report.

Visit to B&K Construction Company, St. Ann, Missouri

On June 24, 1976, Mr. Robert S. Davis, Vice President, B&K Construction Company, was interviewed. Davis stated that the amount of material shown on the invoices submitted to Cotter Corporation was disposed of by trucking to the West Lake Landfill during the period July 16 to October 9, 1973 with the exception of 5,000 tons. He indicated that this 5,000 tons represented topsoil stockpiled in one corner of the Latty Avenue site. He had removed it and then returned it to the site after disposal operations were completed. This topsoil along with other topsoil was used to dress the site. He felt that he should be paid for handling the stockpiled topsoil and that the 5,000 tons was included in the amounts on the invoices sent to Cotter Corporation.

Davis stated that while there was no charge for dumping the material at West Lake, he had arranged to have the individual operating the scales there to record the weights of each truck on sheets of paper. He indicated he was required by Cotter Corporation to submit these weight sheets with the invoices. Davis provided copies of the weight sheets which bear the heading "B&K Dirt Hauling" and the date. The following information is

recorded: truck number, gross, tare, and net weights. A spot check was made of the totals of the net weights shown on the sheets as well as the totals of the net weights for a billing period with the weights on the covering invoice. No discrepancies were found. There were a total of 104 weight sheets associated with these invoices. The total weight of material trucked to the disposal area shown on the invoices was 48,544.70 tons. Subtracting the 5,000 tons of topsoil referred to above, the amount of material trucked to the disposal area was 43,544.70 tons. The invoices also show a total of 10,763.41 tons of material were shipped by rail to Canon City.

Although the above invoices and weight sheets did not indicate the disposal area to which the material was taken, Davis stated that it was taken to the West Lake Landfill. He offered for review a job card record relating to the Latty Avenue site and several entries were noted for the period July 16, 1973 to October 10, 1973 which indicated residue was taken to West Lake from Cotter, Latty Avenue.

Davis also stated that in addition to using his own trucks, he arranged for much of the hauling to be done by other trucking firms. He made available for review from his records, bills from these firms. Weekly billing statements, with drivers time tickets attached, covering the period August 3, 1973 to October 12, 1973 were noted from Walker Trucking Service, Ferguson, Missouri. These billing statements contain the notation "Latty Avenue to West Lake." Billings were also reviewed which had been received from the following: Bruce Barnes Truck Service, St. Louis; Vic Koepke Excavating and Grading Company, Bridgeton; and H. Reeder Hauling, Inc., St. Louis. On at least some of these billings, there are entries showing that material was hauled from "Latty Avenue" or "Cotter" to West Lake.

It is concluded that the material in question is now buried under about three feet of clean soil at the West Lake Landfill. While little significance was attached to the actual location of the disposed material at the time of the 1974 inspection, the licensee was notified, by letter dated November 1, 1974, that the disposal did not appear to be within the intent of the Commission's 10 CFR 40 regulations (Exhibit E) concerning alteration of source material to obtain a mixture no longer subject to licensing.

Visit to Latty Avenue, Hazelwood, Missouri Site and West Lake Landfill, Bridgeton, Missouri Site

On August 11, 1976, two Inspection and Enforcement Region III inspectors visited the Latty Avenue site and West Lake Landfill site for the purposes of performing radiation surveys and collecting environmental samples. The Region III inspectors were accompanied by Mr. Stephen Nagle to the Latty Avenue site and Mr. Clarence Stein to the West Lake Landfill site. Messrs. Nagle and Stein represented the State of Missouri Division of Environmental Quality, Department of Natural Resources.

The results of the August 11, 1976 surveys of the Latty Avenue site and the West Lake Landfill site with a narrative and reference material are attached to this report as Attachment A.

Results of the analyses of the environmental samples taken on August 11, 1976 from the Latty Avenue site and West Lake Landfill site are attached to this report as Attachment B.

Measurements performed at the West Lake Landfill and analyses of samples from the area have been reviewed. The following hazard analysis is based on the measurements and analyses and on information derived from personnel of the former licensee.

Direct Radiation - West Lake Landfill

Beta-gamma measurements made at three feet from the surface indicate two general areas where readings above background were noted. These measurements indicated 0.06 mrad/hr maximum. The measurements at contact indicated 0.8 mrad/hr maximum, and about 0.1 mrad/hr average. Thus, for continuous exposure the maximum gonadal or whole body dose would be:

$$0.06 \text{ mrad/hr} \times 8.76 \times 10^3 \frac{\text{hrs}}{\text{year}} \approx 500 \text{ millirads/year or approximately } 500 \text{ millirems/year.}$$

However, the area has been closed for dumping by Missouri DNR and is essentially unoccupied.

Calculated Atmospheric Concentrations of Rn-222 at West Lake Landfill

West Lake Landfill area sample analytical results do not indicate the presence of significant natural uranium activity. These surface samples, however, would not be expected to be representative of material which is reportedly covered by overburden with a thickness of approximately one meter.

According to information provided by the licensee, the covered material consists of approximately 7 tons of natural uranium in about 8,700 tons of barium sulfate and about 39,000 tons of soil. Thus, an approximate natural uranium weight percentage of the mixture would be 0.015 percent. With a natural uranium specific activity of 6.77×10^{-7} Ci/g, the specific activity of the mixture would be approximately 1.0×10^{-10} Ci/g or 1.0×10^{-4} uCi/g. Analysis of two surface samples from the Latty Avenue site (source of the covered material) indicated natural uranium concentrations of approximately 1.0×10^{-4} uCi/g, which supports this estimate of average mixture concentration. The Ra-226 analysis showed an average concentration of about 1.0×10^{-3} uCi/g for the two samples.

Calculations have been performed to estimate radon-222 emanation from the ground, due to buried material with an average Ra-226 concentration of 1.0×10^{-3} uCi/g below a depth of 100 cm. These calculations indicate a total release of approximately 0.1 uCi/sec of radon-222 from the ground due to the covered tailings mixture. It should be noted that the assumed depth of burial yields a reduction of about a factor of three below what emanations would exist, assuming no cover.

Additional calculations were performed using the "virtual point source" method for determining average air concentration of radon-222 above the covered material. The area was estimated to be approximately square, with a dimension of forty meters. This calculation yielded an approximate $\frac{1}{0}$ atmospheric dispersion coefficient in the center of the area of 1.7×10^{-2} sec/m.

Applying this coefficient to the release rate of 0.1 uCi/sec yields an average increase in background air concentration of 1.7×10^{-3} uCi/m³ directly over the covered tailings, which is about one-half of the 10 CFR 20 unrestricted area concentration limits. This Rn-222 contribution in air, due to the buried materials, would be indistinguishable from background within a few hundred meters from the landfill. Based on the conservatism of assumptions, this atmospheric concentration of Rn-222 is considered an upper limit. Calculations are appended to this report as Attachment C.

Other Pathways

Pathways other than direct exposure and inhalation of radon-222 and progeny do not appear to be significant. No likely means of an ingestion pathway were identified, and inhalation due to fugitive dusting can be discounted since the material is covered and not subject to becoming airborne. An evaluation of the potential for groundwater contamination could not be made in the absence of information concerning the hydrogeologic character of the local area. Three shallow (about 20 feet) wells in the area were all found to be dry at the time the IE:III inspectors visited the site, precluding collection and analysis of groundwater samples. As noted above, barium sulfate and U_3O_8 are known to be insoluble in water.

Future Development

It is noted that the radium 226 concentration of materials presumed buried at the West Lake Landfill approximates that found in tailings materials used for leveling, aggregate and backfill under or around the foundations of dwellings in certain western Colorado communities. Some of these Colorado dwellings experience indoor radon 222 concentrations capable of yielding exposures approaching those implied in the occupational limits of 10 CFR 20. Differences in the physical and chemical natures of the West Lake Landfill and the western Colorado tailings, however, suggest a lower radon release fraction for materials of the type buried at the land fill. Recognizing the potential for radon buildup in

dwellings and the uncertainties concerning certain parameters needed to estimate that potential at the West Lake Landfill, a complete environmental impact assessment is necessary to accurately evaluate the hazard potential for this pathway.

Comparison with 10 CFR 20 Criteria

Finally, it should be noted that a licensee may bury up to about two tons of natural uranium per year (in twelve increments) within criteria contained in 10 CFR 20 concerning depth (4 feet) and spacing (6 foot spacing between locations). Thus, in four years, eight tons could be disposed of in forty-eight one-sixth ton batches buried in a grid with six foot centers. Such a grid would comprise an area significantly smaller than that found in this case, while containing about the same quantity of disposed uranium.

0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	
0	0	0	0 ⁶	0 ^{ft}	0	0	0	
0	0	0 ⁶	0 ^{ft}	0	0	0	0	36 ft ~ 11 m
0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	
36 ft ~ 11 m								

Conclusion

Seven tons of uranium could be disposed of by burial in accordance with 10 CFR 20.304 in an area significantly smaller than that now existing at the West Lake Landfill. Based on our estimates of maximum potential exposure conditions by various pathways, it is concluded that the material now present at the West Lake Landfill does not represent a radiological hazard by any pathway yet identified. Based on studies of the use of uranium tailings for backfill and leveling under and around residence foundations in Colorado, it is estimated that increased indoor radon and radon progeny concentrations could be experienced in structures built directly in or on the disposed tailings. An environmental impact analysis is required for an accurate estimate of the hazard potential for this pathway.

Attachments:

1. Attachments A, B, C and D
2. Exhibits A-E
3. References 1-4

ATTACHMENT A

During a survey performed by this office on August 11, 1976, to determine the effectiveness of Cotter Corporation's decommissioning of their Hazelwood, Missouri (Latty Avenue) site, a difference in the radiation readings supplied by Cotter and those found by this office was noted.

On May 10, 1974, Cotter reported exposure rates which ranged from 0.01 to 0.4 mR/hr measured at three feet above grade (type of instrument unknown). (Reference 1) These values were the basis for termination of the license by the Directorate of Licensing. (Reference 2) The Region III August 11, 1976 survey, made at the same distance, yielded readings ranging from 0.3 to 0.8 mrad/hr beta-gamma. (Reference 3) Additionally, a survey at one centimeter revealed two areas reading 1.2 and 1.8 mrad/hr beta-gamma. The instrument used by IE:III inspectors in performing these measurements was an Eberline E-500B with an end-window Model HP-190 Hand Probe (1.4-2 mg/cm²).

The presently acceptable limit for release of ground areas, as implied in the "Decontamination Guide" (Reference 4) is 0.4 mrad/hr, total, or 0.2 mrad/hr, average, with a maximum of 1.0 mrad/hr, all of which are to be measured at 1 cm with a probe of not more than 7 mg/cm² of total adsorber. Thus, the NRC Region III survey of August 11, 1976 showed radiation levels at the Latty Avenue site exceeding the acceptable release limits, while the survey performed by Cotter Corporation showed levels within the guidelines. Both surveys indicate a low, non-hazardous radiation level. The difference in results might be attributable to differences in instruments and procedures used. The August 11, 1976 surveys were the first independent examination by NRC of radiation levels at the Latty Avenue site.

ATTACHMENT B

ENVIRONMENTAL SAMPLE
Analytical Results by HSL

Sample No.	Sample Description	Results (uCi/g)	
		Natural Uranium	Ra-226
L-1	Soil	$1.2 + 0.1 \text{ E-4}$	$1.4 + 0.03 \text{ E-3}$
L-2	Soil	$7.5 + 0.1 \text{ E-5}$	$5.14 + 0.14 \text{ E-4}$
L-3	Vegetation	$2.6 + 0.2 \text{ E-5}$	--
L-4	Wet Sediment From Cold Water Creek	$5.3 + 0.4 \text{ E-6}$	--
W-1	Soil	$5 + 2 \text{ E-7}$	--
W-2	Soil	$5.3 + 0.4 \text{ E-6}$	--

- Note:**
- 1) L-1 through L-4 collected at Latty Avenue Site
 - 2) W-1, W-2 collected at West Lake Landfill
 - 3) L-3 vegetation dried, analyzed dry, reported as wet weight
 - 4) L-4 dried prior to analysis
 - 5) A systemic error of + 20% should be assigned to Ra-226 analysis due to uncertainty of the equilibrium between Rn-222 and Rn-226. An 80% equilibrium ratio was assumed.

ATTACHMENT C
Rn-222 Emanation Calculations

1. Rn-222 at the Spoils/Cover Interface

$$\begin{aligned}\text{Total release} &= (\text{area}) \times (\text{source flux}) \\ &= (1600 \text{ m}^2) \times DC_0 (\lambda/(DS))^{1/2}\end{aligned}$$

Kraner, et al, the Natural Radiation Environment, 1964

Assume:

$$D = 1.5 \times 10^{-2} \text{ cm}^2/\text{sec}$$

$$\begin{aligned}C_0 &= (1.0 \text{ nCi/g})(1.6 \text{ g/cm}^3)(1 \times 10^{-1}) \\ &= 0.16 \text{ nCi/cm}^3 = 160 \text{ pCi/cm}^3\end{aligned}$$

$$\lambda = 2.099 \times 10^{-6} \text{ sec}^{-1}$$

$$S = 0.25$$

$1 \times 10^{-1} = 10\%$ "emanation power"
(fraction escaping solid soil gas)
Tanner, The Natural Radiation Environment, 1964

0.25 = soil "void fraction"

$$\begin{aligned}\text{Total release} &= (1.6 \times 10^7)(1.5 \times 10^{-2})(160)(2.099 \times 10^{-6}/(1.5 \times 10^{-2}/0.25))^{1/2} \\ &= (3.84 \times 10^7)(3.5 \times 10^{-5})^{1/2}\end{aligned}$$

$$\begin{aligned}\text{Total release} &= 2.3 \times 10^5 \text{ pCi/sec} \quad \text{over } 1.6 \times 10^7 \text{ cm}^2 \\ \text{area release} &= 1.44 \times 10^{-2} \text{ pCi/cm}^2 \cdot \text{sec}\end{aligned}$$

2. Rn-222 at the Surface of the Cover

$$C_2 = C_1 \exp(-Z(\lambda/D)^{1/2})$$

Tanner, The Natural Radiation Environment, 1964

Assume:

$$C_1 = 1.44 \times 10^{-2} \text{ pCi/cm}^2 \cdot \text{sec}$$

$$D = 1.5 \times 10^{-2} \text{ cm}^2/\text{sec}$$

$$\lambda = 2.099 \times 10^{-6} \text{ sec}^{-1}$$

$$Z = 100 \text{ cm}$$

$$C_2 = (1.44 \times 10^{-2}) \exp(-100 (2.099 \times 10^{-6}/1.5 \times 10^{-2})^{1/2})$$

$$= (1.44 \times 10^{-2}) \exp(-1.18)$$

$$= (1.44 \times 10^{-2}) (0.31)$$

$$C_2 = 4.4 \times 10^{-3} \text{ pCi/cm}^2 \cdot \text{sec}$$

$$\text{Entire area: } (4.4 \times 10^{-3}) (1.6 \times 10^7) = 7.0 \times 10^4 \text{ pCi/sec}$$

Therefore, the total emanation rate is about 70 nCi/sec, or about 0.1 μ Ci/sec.

- 2 -

3. Atmospheric Dispersion Coefficient

$$X/Q = 1/\pi \sigma_y \sigma_z u$$

σ_y and σ_z are calculated using the "virtual point source" method described in Workbook of Atmospheric Dispersion Estimates, as follows:

- a. for a square area with 40m sides, $\sigma_{yo} = S/4.3 = 40/4.3 = 9.3\text{m}$
- b. in the area, $\sigma_{yo} = \sigma_y = 9.3\text{m}$
- c. at 20m (center of area from side), stability class E, and ground-level release, $\sigma_z = 1\text{m}$
- d. assume annual avg. windspeed is 2 m/sec

$$X/Q = 1/(3.14)(1)(9.3)(2) = 1.7 \times 10^{-2} \text{ sec/m}^3$$

4. Concentration in Air

$$\text{Concentration} = (0.1 \text{ uCi/sec})(1.7 \times 10^{-2} \text{ sec/m}^3) = 1.7 \times 10^{-3} \text{ uCi/m}^3$$

SUPPLEMENTAL REPORT

INVESTIGATION FOR URANIUM/THORIUM

COTTER CORPORATION, LATTY AVENUE SITE, ST. LOUIS, MISSOURI

OCTOBER 20, 1976

Pursuant to the ongoing investigation of possible uranium/thorium contamination at the Latty Avenue site, Messrs. J. A. Pagliaro and G. T. Gibson performed a site inspection on October 20, 1976. The purpose of this inspection was to identify the property owner from county tax records, to survey the property with beta-gamma and alpha survey instrumentation, and to obtain selected soil and vegetation samples for laboratory analyses.

The records reviewed at the St. Louis County Building, 41 South Central, St. Louis, Missouri, were the current county property tax rolls. County personnel stated the tax records examined were dated as of July 1976. The record indicated the following:

Address: 9200 Latty Avenue

Owner: Commercial Discount Corporation
55 East Monroe Street
Chicago, Illinois 60602

Size: 3.5 acres

Telephone communication with IE:III was performed to ascertain whether the property had since been transferred. Additional information was received which indicated Commercial Discount Corporation had transferred ownership of the property in August 1976 to the Bayless Company, 175 Outer Road West, Valley Park, Missouri.

A site investigation was then performed and samples were obtained. Figure 1 indicates the relative position of various buildings, landmarks, and locations of collected samples. The area in Figure 1 encompassing the abandoned garage, abandoned warehouse building, and the abandoned and boarded-up burned building was estimated to be approximately three (3) acres. The entire area, including the warehouse area and plowed field, was estimated to be in excess of six (6) acres.

- 2 -

A survey of the plowed field utilizing the beta-gamma instruments indicated only background activity (<0.1 mR/hr), except for several small yellow-colored chunks of surface material. The location of the "yellow surface" material is shown in Figure 1. The "yellow surface" chunks ranged in size from 4 x 4 x 1 inches to small flakes. The material was somewhat fibrous in texture. The "yellow surface" material had an apparent beta-gamma flux of 10 mR/hr at contact. Approximately 1.5 pounds of the "yellow surface" was collected for laboratory analysis. Several holes were dug to a depth of 15 inches but no subsurface yellow material was excavated.

Selected soybeans were collected from the plowed field, within ten feet of the "yellow surface" material. Approximately 1/4 pound of soybeans were collected for laboratory analysis. A background control soybean sample was obtained later, a distance of 7 miles from Latty Avenue.

A rusting abandoned hopper, shown in Figure 1, was surveyed for beta-gamma and alpha activities. Survey results showed no significant activity above background ($< .1$ mR/hr beta-gamma, 500 DPM alpha).

The warehouse building was surveyed with beta-gamma and alpha instruments. The floor of the warehouse was composed of dirt and broken concrete. Several elevated readings above background activity were recorded. The highest apparent location was in the center of the warehouse, beside a support column. Readings of up to 0.8 mR/hr beta-gamma and 30,000 DPM alpha were observed. A "warehouse dirt" sample, consisting of approximately 2 pounds of topsoil was obtained for laboratory analysis.

Preliminary radiological analyses were performed at IE:III using beta-gamma, alpha, and gamma-spectroscopy instrumentation. The samples were then forwarded to ERDA:Health Services Laboratory (HSL), Idaho Falls, Idaho.

The results of the IE:III analyses showed no detectable activity in either soybean sample. The "yellow surface" sample showed 10 mR/hr beta-gamma and 4,000 DPM alpha at contact with a few grams of material. Gamma scanning with an unshielded NaI crystal indicated the presence of uranium isotopes but not thorium and thorium daughters. The "warehouse dirt" sample showed 0.3 mR/hr beta-gamma and 26,000 DPM alpha at contact with a sample of about 250 g. Gamma scanning with NaI indicated both uranium and thorium and their decay chain products to be present.

- 3 -

The results of alpha spectroscopic analyses of the two soil samples by HSL are presented in Table I below. HSL analyses of the two soybean samples showed only small quantities of naturally-occurring K-40.

TABLE I

<u>Sample</u>	<u>Radionuclide</u>	<u>Alpha Spectroscopic Concentration (uCi/g)</u>		
Warehouse Dirt	Th-230	3.61	$\frac{+}{-}$	0.05 E-02
	Th-227	4.4	$\frac{+}{-}$	0.2 E-04
	U-238	6.64	$\frac{+}{-}$	0.06 E-04
	U-234	6.52	$\frac{+}{-}$	0.06 E-04
	U-235	3.09	$\frac{+}{-}$	0.07 E-05
	Ra-226	5.2	$\frac{+}{-}$	0.1 E-04
Yellow Material	U-238	0.3	$\frac{+}{-}$	0.1
	U-234	0.3	$\frac{+}{-}$	0.1
	U-235	0.3	$\frac{+}{-}$	0.1 E-02

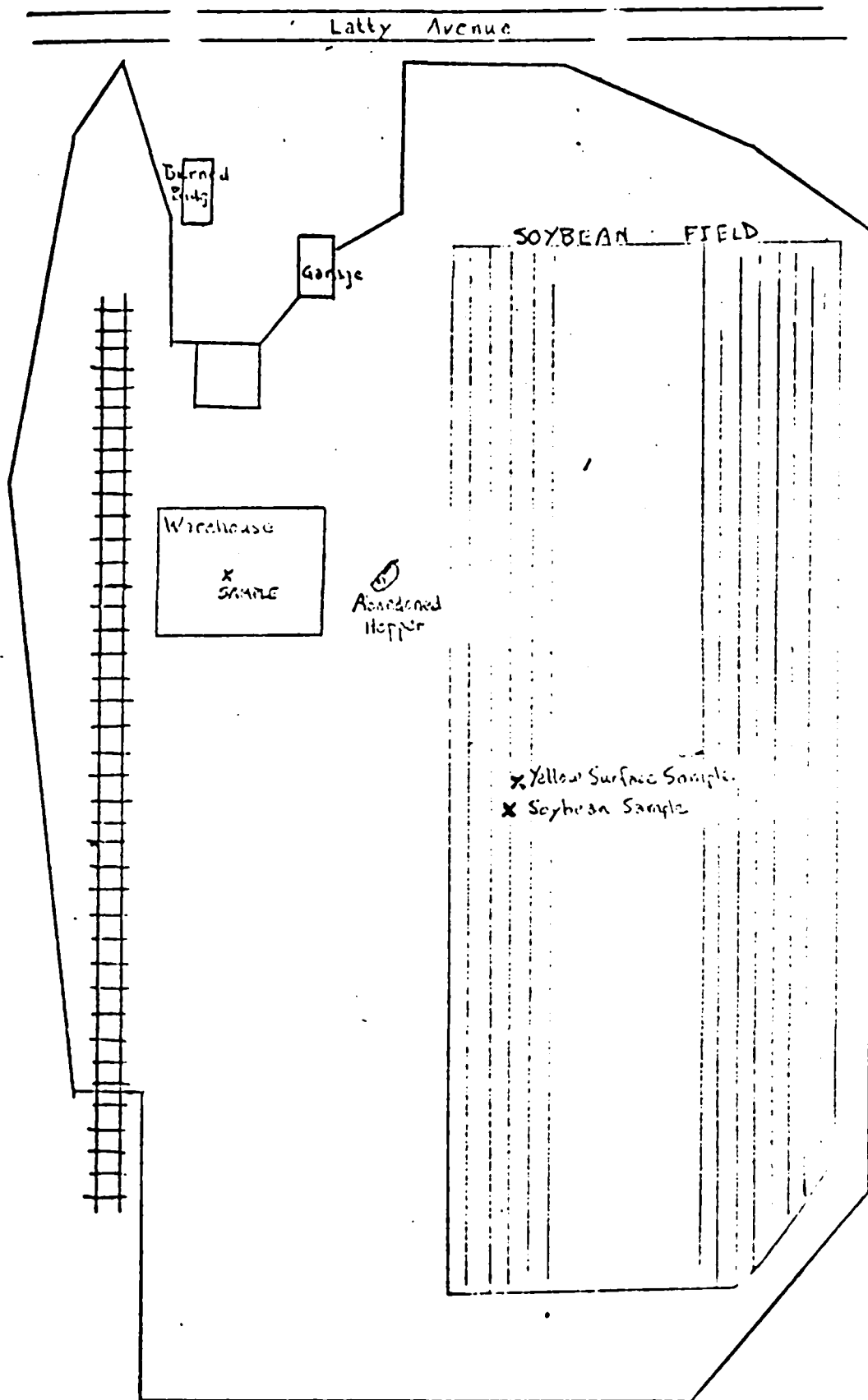
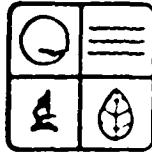


FIGURE 1

Locations of sampling and surveys -
9400 Lally Ave., October 20, 1966



CHRISTOPHER S. BOND
GOVERNOR

JAMES L. WILSON
DIRECTOR

missouri department of natural resources

P. O. Box 1368 Jefferson City, Missouri 65101 314/751-2815

June 2, 1976

Mr. James G. Keppler
Regional Director
U.S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, IL 60137

Dear Mr. Keppler:

In articles published May 30 and June 1 (copies enclosed) St. Louis Post-Dispatch reporter Margaret W. Freivogel presented evidence that some seven tons of uranium were dumped in 1973 at the West Lake Landfill in St. Louis County by an Atomic Energy Commission subcontractor removing radioactive waste material from a site in Hazelwood, Missouri. The area was closed as an industrial and sanitary landfill by this Department in 1974 (a new sanitary landfill in an adjacent area protected from groundwater contact now operates under DNR permit). The closed area where the dumping allegedly occurred may be in direct contact with groundwater. It has no monitoring wells to permit evaluation of groundwater contamination.

In your letter to me of February 19, 1976 you stated that "a review by the then AEC showed there was no significant health or environmental hazard associated with the burial". The letter to Cotter Corporation from John G. Davis you enclosed stated, "It is our understanding from your contractor that the material was then deposited under about 100 feet of refuse and earth at St. Louis County sanitary landfill No. 1." The investigation by the Post-Dispatch indicates that AEC did not know the correct location of the dumping, the local geology, nor the actual concentration of uranium dumped. The depth cited must also be incorrect since no landfills in the St. Louis area contain 100 feet of fill. I must therefore question the validity of the AEC "review" of the burial operation.

I respectfully request that in view of the concerns of this Department and the people of the St. Louis area, that the Nuclear Regulatory Commission takes steps to:

1. Provide me with all documents which might assist me in verifying the Post-Dispatch report, and in establishing the exact amount and chemical form of radioactive materials allegedly dumped at West Lake.

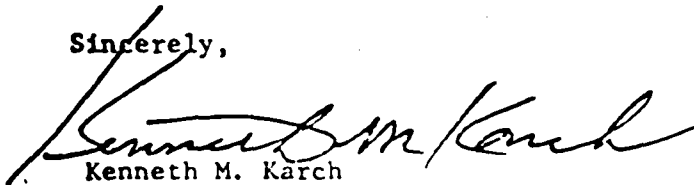
Exhibit A
1 of 4

Mr. Keppler
Page 2
June 2, 1976

2. Require the Energy Research and Development Administration, as successor to AEC's source material operations, to
 - a) Include the West Lake Landfill in the areas it has selected for intensive aerial and ground level radiation monitoring.
 - b) Locate the uranium precisely within the landfill, both as to position and depth.
 - c) Install appropriate groundwater monitoring wells and implement a monitoring program to determine the extent, if any, of groundwater contamination.
 - d) Recommend actions to be taken to protect landfill workers and the public from any potential hazards associated with this material.
3.
 - a) Advise me on who would be liable in the event that cleanup costs are involved.
 - b) Ascertain whether federal laws or regulations were violated by either the Atomic Energy Commission or its subcontractor in the disposal of source material at an unlicensed site.

In a related matter, I was disappointed to learn that you do not maintain records of radioactive waste burials carried out by licensees under authority of Section 20.304 of Title 10 CFR. I hereby respectfully request that your office obtain such records from all Missouri licensees who have made such burials and make these records available to me.

Sincerely,



Kenneth M. Karch
Director
Division of Environmental Quality

KMK:JE:jhb
cc: Robert J. Koke, EPA Region VII
Enclosure

AY, MAY 30, 1976

282 PAGES

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In addition to being wrong about the volume of the waste, federal records are wrong also about its location. The AEC report said the material had been deposited at "St. Louis County Landfill No. 1 on Old Bridge Road." No such place exists.

The B & K vice president, Davis, confirmed that the material had gone to the West Lake Landfill on St. Charles Rock Road. St. Louis County Landfill No. 1 is on Dorsett and Adie Roads, more than four miles away.

The West Lake Landfill was closed temporarily in 1971 for improvements because state officials found that certain pollutants were leaking from it into the surrounding flood plain soil. No test for radioactivity was made because officials

were unaware that any radioactive materials were in the landfill.

Before the improvements were made, it would have been "irresponsible" to put any hazardous waste at West Lake, said Joseph Elgner, who runs the Missouri hazardous waste program.

The problem at West Lake may have been compounded by using the radioactive material as a daily cover for trash, Elgner said. That would subject the waste to rainwater and the possibility of runoff.

State officials said the radioactive waste posed no immediate health hazard because it was relatively weak and would be extremely diluted by the Missouri River water even if it were to reach the river. There is no evidence

that the radioactive waste did reach the river.

The waste material, according to AEC records, consisted of seven tons of natural uranium mixed with about 50 tons of barium sulfate, a powdery white substance. This waste and other waste products were generated at a nuclear processing plant, now closed, that Mallinckrodt Inc. operated on Desrehan Street, on St. Louis's near North Side.

The barium sulfate and other waste products originally were stored at Lambert Field. Later, some of them were moved to a site at 9200 Latty Road, Hazelwood, in preparation for reprocess-

See DUMING, Page 4

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samples of the truckloads being sent to the landfill, but he acknowledged that they, too, could have been inaccurate.

Federal authorities made no independent measurements of the strength of material and normally do not in a case like this, a spokesman for the Nuclear Regulatory Commission said. Relying on Cotter's records, a federal inspector concluded that the concentration of uranium in the material being dumped was .0031 per cent—well below the .05 per cent limit set in the regulations.

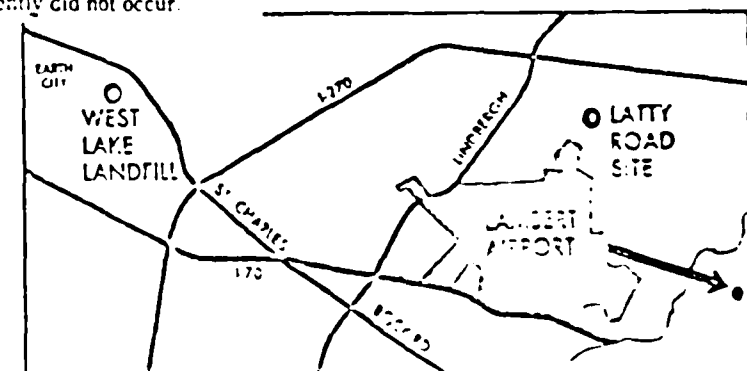
A St. Louis environmental engineering firm, Pyckman, Edgerly, Tomlinson and Associates, had been hired to monitor pollution levels at the site. But it also made no independent tests of the truckloads being sent to the landfill, said Phillip Feeney, who worked on the project.

The report, although Mark Feeney's company contended that all activities had been closely watched by his company, the engineering firm and the AEC, none of the three actually saw or tested the material being dumped at the landfill.

the Hazelwood site for radiation and found it clean.

AEC investigators did find fault with one aspect of the waste disposal. The agency reprimanded Cotter Corp. in a letter for diluting the waste with the 39,000 tons of soil—ironically, the practice that apparently did not occur.

Federal regulations prohibit the dilution of radioactive material to reduce the concentration so that the material will fall outside the .05 per cent limit set for more stringent handling of the waste, the letter said.



RADIOACTIVE WASTE storage areas. Map indicates where the barium sulfate was originally stored, the site at 9200 Latty Road, and where it was moved, the West Lake Landfill at St. Charles.

3 of 4

Radioactive Materials Checks Called Faulty

By MARGARET W. FREIVOGEL
Of the Post-Dispatch Staff 2-1-76

No one adequately monitors radioactive materials in Missouri and the state is unprepared to handle accidental releases of radiation, two state officials familiar with the situation say.

The dumping of several thousand tons of low-level radioactive waste at the West Lake Landfill in St. Louis County, disclosed Sunday in the Post-Dispatch — is only one of several nuclear-related problems, said Kenneth M. Karch and Martin Nodiff.

Karch is director of environmental quality for the state Department of Natural Resources; Nodiff is the department's director of planning and policy development.

There is no evidence that the West Lake dumping caused a health hazard, but it apparently confused federal authorities who were supposed to be keeping track of the material.

False business records of the transaction caused federal officials to have incorrect records about the strength, volume and location of the material, the Post-Dispatch found.

James Allen, chief of a firm being monitored in connection with the dumping criticized the way monitoring is done.

"I'm one of the Atomic Energy Commission's most outspoken critics," said David P. Marcott, executive vice president of Cotter Corp., which had purchased the waste material to extract valuable ores it contained.

"Ninety-nine per cent of the time they (federal authorities) don't know what's going on even when they have someone standing there."

As a citizen and as a member of this industry, I'd like to see them do a better job," Marcott said.

Nodiff and Karch said they were disturbed by the West Lake incident because it was, in their opinion, indicative of serious gaps that exist in the monitoring of low-level waste.

The federal Nuclear Regulatory Commission, which replaced the now defunct Atomic Energy Commission, is too short-handed to investigate comprehensively, the officials said. State officials have no authority to fill in for the federal agency, they said.

They listed several problems, including:

(1) Inadequate monitoring of a disposal site at Sinclair Farms near Columbia, Mo., where low-level radioactive waste is buried in plastic bags.

(2) Inadequate preparations for possible accidents at two nuclear power plants situated near enough to Missouri to cause injury in the state and from Union Electric Company's Callaway County plant now under construction.

(3) Inadequate attention to the transportation of radioactive materials through the state. Tri-State Motor Co., the largest transporter of nuclear materials in the nation is based in Joplin, Mo. However, most of its cargo does not pass through Missouri, a study by the Department of Natural Resources found.

Karch and Nodiff failed to convince the

Legislature to enact a radiation protection act during the last session. It would have empowered state officials to monitor more effectively waste disposal and transportation. The state officials plan to urge enactment of the legislation again next session.

"The federal agencies just aren't manned to do a thorough and comprehensive job," Nodiff said. "They're forced to set priorities on what they inspect. They start with Mallinckrodt (which manufactures large amounts of radiopharmaceuticals), and they're taking care of that. But when you get down to the bottom of the list they might be hitting someone only once every 20 years."

A federal atomic safety official said he thought the monitoring program was comprehensive enough.

"It's disturbing that we might have got incorrect information (about the West Lake disposal)," said James Allen, chief of the fuel facility and material safety branch at the Nuclear Regulatory Commission's regional office in Glen Ellyn, Ill. "But when there's no health hazard involved in a situation, strict monitoring of it would be taking people away from more important health issues."

Allen said he was not concerned about the agency being duped. The West Lake episode was an isolated incident, he said.

In that case, B&K Construction Co., Inc., apparently submitted false invoices to Cotter Corp. claiming that it had moved nearly 10,000

tons of waste and soil in 1971 to the site situated at St. Charles Rock Road and 72 Road.

In fact, a B&K officer admitted recently the firm actually had moved less than 500 tons. Relying on the incorrect figures, an atomic safety inspector concluded that the waste been diluted with soil to reduce its radioactivity.

Consequently, the inspector's report was error on the strength, volume and location of waste. Despite the errors, federal and state officials said the material posed no health hazard.

Safety chief Allen added that he was worried about the waste burial site at Sinclair Farms near Columbia, Mo., the site established in 1971 to save the cost of shipping the low-level waste material to a federal disposal area in Shallowford, Md., Ill.

Allen said the material, originating from research projects at the University of Missouri, was very low in radioactivity and its use governed by federal regulations.

But Karch said he was disturbed that the Sinclair Farms had not been thoroughly studied before burial was started. He was concerned also, federal officials relied too heavily on the instead of independent investigations or keeping track of activities there.

The Nuclear Regulatory Commission said it had not a letter from Cotter Corp. claiming that it had moved nearly 10,000 tons of waste and soil in 1971 to the site situated at St. Charles Rock Road and 72 Road.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

JUN 17 1976

Mr. Kenneth M. Karch
Director, Division of
Environmental Quality
Missouri Department of
Natural Resources
P. O. Box 1368
Jefferson City, Missouri 65101

License No. SUB-1022

Dear Mr. Karch:

This is in response to your letter dated June 2, 1976, requesting additional information and follow-up action relative to the burial of some seven tons of natural uranium in a St. Louis County landfill in 1973.

The information published in the St. Louis Post-Dispatch on May 30 and June 1, 1976, which was enclosed with your letter of June 2, 1976, is new to this Office and, as you pointed out, conflicts with the information obtained by our inspectors in 1974. Based on this apparent discrepancy, the NRC plans to initiate a full investigation into this matter during the week beginning June 20, 1976. The findings from this investigation, which will be made available to you, will determine the need for further NRC action. At the conclusion of the investigation, all documents relative to this burial will be provided to your Office.

With respect to your June 2, 1976 letter, I would like to clarify one apparent misconception at this time. The Cotter Corporation, which was responsible for this burial, was an AEC licensee — not an AEC subcontractor. Consequently, the Energy Research and Development Administration has no responsibility with regard to this material. As a former licensee, the NRC will look to Cotter Corporation to correct any safety or environmental related problems identified through our investigation.

Regarding your other request that this office obtain from materials licensees in the State of Missouri records of low level radioactive waste burials under 10 CFR 20.304, I must reiterate that there is no NRC regulation that requires reporting waste burials under 20.304. Therefore, there is no



Mr. Kenneth M. Karch

- 2 -

JUN 17 1976

basis for such a request to the licensees. If you believe that the NRC's current regulations concerning such burials are inadequate, you may petition the NRC for consideration of a change of the regulations. This rulemaking petition should be submitted under the provisions of 10 CFR 2.802, a copy of which is enclosed.

If you have any questions concerning the above, please let me know.

Sincerely yours,

James G. Keppler
Regional Director

Enclosure:
10 CFR 2.802

cc w/o encl, w/ltr dtd 6/2/76:
R. J. CokeEPA Region VII
M. W. Freivogel, St. Louis Post-Dispatch
D. P. Marcott, Cotter Corporation

bcc w/o encl, w/ltr dtd 6/2/76:
J. G. Davis, Deputy Director
D. Thompson, IE:HQ
L. Rouse, NMSS
S. Schwartz, SLR
J. Fouchard, PA
Central Files
IE Mail and File Unit
PDR
NSIC

Exhibit B
2 of 2

Telephone
Harrison 7-5566

INVOICE

469 1973



B. & K. Construction Company, Inc.

97 GENERAL PAVING CONTRACTORS
4140 Cypress Road, St. Ann, Missouri

Nº 10353

"PAVE THE WAY WITH B & K"

B&K

B&K

Cotter Corporation
P.O. Box 751
Cannon City, Colorado 81212

• DRIVEWAYS

• STREETS

• SUBDIVISIONS

• FACTORY FLOORS

• PARKING LOTS

Project Contact

Approved

7/31/73

JOB SITE: Latty Avenue, St Louis County

Material trucked to disposal site	4981.85 tons @ \$
Material shipped by railroad	2341.75 tons @ \$

THIS INVOICE IS DUE AND PAYABLE WITHIN 10 DAYS AS PER AGREEMENT.

OK
W. C. [Signature]

1319
2102

RECEIVED

Exhibit C
1 of 11

Telephone
Harrison 7-5566

INVOICE

AUG 15 1973

B. & K. Construction Company, Inc.

GENERAL PAVING CONTRACTORS

140 Cypress Road, St. Ann, Missouri

"PAVE HIGHWAY WITH B & K"

No 1038

Cotter Corporation
P.O. Box 751
Cannon City, Colorado 81212

- DRIVEWAYS
- STREETS
- SUBDIVISIONS
- FACTORY FLOORS
- PARKING LOTS

8/10/73

JOB SITE: Latty Avenue, St. Louis County

Material trucked to disposal site Aug. 1st thru Aug. 9th - 8373.75 tons
@ \$

Material shipped by railroad Aug. 1st. thru Aug. 9th - 846.70 tons
@ \$

8373.75 tons @ \$5.02 (scale charge)

THIS INVOICE DUE AND PAYABLE WITHIN TEN (10) DAYS

Exhibit C
2 of 11

son 7-5666

INVOICE

AUG 21 1973

B. & K. Construction Company, Inc.

GENERAL CONTRACTORS
 4140 Cypress River St., St. Louis, Missouri
 "PAVE THE WAY WITH B & K"
 Sales Tax *BeB*
 Discount
 1/2% St. Made ☒
 1/2% St. Made ☒
 1/2% St. Made ☒
 Prices Correct *BeB*
 Approved *[Signature]* 8/17/73

No 1038

Cotter Corporation
 P.O. Box 751
 Canon City, Colorado 81212

- DRIVEWAYS
- STREETS
- SUBDIVISIONS
- FACTORY FLOORS
- PARKING

JOBSITE: Latty Avenue - St. Louis County

August 10 through August 16:

6,304.10 tons hauled to disposal area by truck @ \$

486.95 tons shipped by rail @ \$

6,304.10 tons @ \$ scale charge

\$

THIS INVOICE DUE AND PAYABLE WITHIN TEN (10) days.

1349
2102Exhibit C
3 of 11

telephone
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INVOICE

AUG 28 1973



B. & K. Construction Company, Inc.

GENERAL BUILDING CONTRACTORS

4140 Cypress Road, St. Ann, Missouri

"PAVE THE WAY WITH B & K"

Nº 1037

Cotter Corporation
P.O. Box 751
Cannon City, Colorado 81212

Price Correct
Approved M. P. C. 8/24/73

- DRIVEWAYS
- STREETS
- SUBDIVISIONS
- FACTORY FLOORS
- PARKING LOT

JOB SITE: Latty Avenue

AUG 28

August 17 through August 23:

5,895.40 tons hauled to disposal area by truck @ \$

1,674.80 tons shipped by rail @ \$

5,895.40 tons @ scale charge

OK
W. G. D.

KEY PUNCH

THIS INVOICE DUE AND PAYABLE WITHIN TEN (10) DAYS.

#1319 2102

RECEIVED AUG 27 1973

Exhibit C
4 of 11

Telephone
Harrison 7-5666

INVOICE

8-31-73

B. & K. Construction Company, Inc.

GENERAL PAVING CONTRACTORS

9140 Express Road, St. Ann, Missouri

Nº 10393

PAVE THE WAY WITH B & K

BeB

Cotter Corporation
P.O. Box 751
Cannon City, Colorado 81212

• DRIVEWAYS

• STREETS

• SUBDIVISIONS

• FACTORY FLOORS

• PARKING LOTS

8/31/73

JOBSITE: Latty Avenue, St. Louis County

Material trucked to disposal site 6421.45 tons @ \$

Material shipped by railroad 1231.10 tons @ \$

6421.45 tons @ \$. (scale charge)

THIS INVOICE IS DUE AND PAYABLE WITHIN ¹⁰/₁₅ DAYS

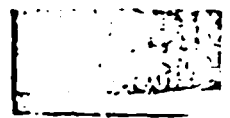
W.C. Galt

KEY PUNCH

#-1319

2162

RECEIVED SEP 4 1973



Telephone
Harrison 7-5566

INVOICE

SEP 12 1973

B. & K. Construction Company, Inc.

GENERAL PAVING CONTRACTORS

4141 Cottage Road, St. Ann, Missouri

"PAVE THE WAY WITH B & K"

Nº 1040

Cotter Corporation
P.O. Box 751
Cannon City, Colorado 81212

• DRIVEWAYS

• STREETS

• SUBDIVISIONS

• FACTORY FLOORS

• PARKING LOTS

Approved A. F. L. 9/17/73

JCSITE: Latty Avenue - St. Louis County

August 31st through Sept. 6, 1973:

5,270.55 tons hauled to disposal area by truck @ \$

1,174.95 tons shipped by rail @ \$

5,270.55 tons @ \$. scale charge

872.10 tons top soil hauled into site @ \$

THIS INVOICE DUE AND PAYABLE WITHIN TEN (10) DAYS.

Exhibit C
6 of 11

Telephone
Harrison 7-5666

INVOICE

SEP 18 1973



B. & K. Construction Company, Inc.

GENERAL PAVING CONTRACTORS
4140 Cypress Road, St. Louis, Missouri

"PAVE THE WAY WITH B & K"

Nº 10405

Cotter Corporation
P.O. Box 751
Cannon City, Colorado 81212

APPROVED _____

9/24/73

• DRIVEWAYS
• STREETS
• SUBDIVISIONS
• FACTORY FLOORS
• PARKING LOTS

JOB SITE: Latty Avenue - St. Louis County

September 7 through September 13, 1973:

4502.65 tons residue trucked to disposal area @ \$
1026.46 tons residue shipped by rail @ \$
4502.65 tons @ \$. scale charge

W. G. Gill
THIS INVOICE DUE AND PAYABLE WITHIN TEN (10) DAYS

#1316

RECEIVED SEP 17 1973

KEY PUNCH

Done 9-21-73

Exhibit C
7 of 11

Telephone
HARRISON 7-5666

INVOICE

B. & K. Construction Company, Inc.

GENERAL BUILDING CONTRACTORS
Location 7711
4140 Cypress Road, St. Louis, Missouri
Date 9/21/73
"PAVE. TIME" WITH "B & K"
Footings and Etc. REB
Sales Tax REB
Insurance REB
A/C Elec. Made REB
Furniture on Almond REB
Goods/Spec Rec'd. REB
Prices Correct REB
Approved REB 9/21/73

Nº 1041

Cotter Corporation
P.O. Box 751
Cannon City, Colorado 81212

- DRIVEWAYS
- STREETS
- SUBDIVISIONS
- FACTORY FLOORS
- PARKING LOTS

JOB SITE: Latty Avenue - St Louis County

Sept. 14th through Sept. 20, 1973:

1602.90 tons residue hauled to disposal area by truck @ \$
1602.90 tons @ \$. scale charge
1335.65 tons shipped by rail @ \$
Dismantling dryer and loading on rail cars
Labor working inside buildings on restoration

KEY PUNCH

= 1316

THIS INVOICE DUE AND PAYABLE WITHIN TEN(10) DAYS.

Exhibit C
8 of 11

Telephone
HARRISON 7-5666

INVOICE

B. & K. Construction Company, Inc.

Nº 10445

Cotter Corporation
P.O. Box 751
Cannon City, Colorado

GENERAL PAVING CONTRACTORS
4140 Cypress Road St. Ann, Missouri
"PAVE THE WAY WITH B & K"
Estimate and Bill
Sales Office
Element
81212
Gordon, E. J. R. D.
Prices Correct
9/28/73

- DRIVEWAYS
- STREETS
- SUBDIVISIONS
- FACTORY FLOORS
- PARKING LOTS

JOB SITE: Latty Ave., St. Louis County

Sept. 21 through Sept. 27, 1973:

2783.65 tons residue hauled by trucks @ \$
2783.65 tons scale charge @ \$
400.15 tons shipped by rail @ \$
5390 tons soil trucked into jobsite @ \$
Labor & equipment dismantling equipment and building
restoration

THIS INVOICE DUE AND PAYABLE WITHIN TEN (10) DAYS.

1316

RECEIVED OCT 1 1973

Exhibit C
9 of 11

1957 15 1958

Exhibit C
10 of 11

Telephone
Harrison 7-5566

INVOICE

OCT 17 1973



B. & K. Construction Company, Inc.

GENERAL BUILDING CONTRACTORS

4140 Cypress Road, St. Ann, Missouri

"PAVE THE WAY WITH B & K"

No 1045

Cotter Corporation
P.O. Box 751
Canon City, Colorado 81212

- DRIVEWAYS
- STREETS
- SUBDIVISIONS
- FACTORY FLOORS
- PARKING LOTS

10/12/73

JCSITE: Latty Avenue, St. Louis County

Oct. 5th thru Oct. 11, 1973:

KEY PUNCH

600.65 tons residue hauled by truck from jobsite @ \$

600.65 tons @ \$ - scale charge

977 Hlift 5 days working inside building - grading,
removing equipment, loading debris

2 Laborers 3 days

Handwritten signature

#1316

RECEIVED OCT 15 1973

Exhibit C
11 of 11



Ryckman/Edgerley/Tomlinson & Associates, Inc.

May 1, 1974
RETA-780

Mr. David P. Marcott
Executive Vice President
Cotter Corporation
Post Office Box 352
Golden, Colorado 80401

Dear Dave:

Attached are two (2) sketches of the Latty Avenue Storage Site. The first depicts the original placement of the residues and buildings. Building "D" was the only building used for the actual drying operation.

The second sketch shows level of activity (MR/hr.) on April 29, 1974, after decontamination had been completed. As you can see, all of the locations fall below the allowable 0.6 MR/hr. (approximately 2,000 counts per minute) level.

If you have any questions or comments, or require additional information, please contact me.

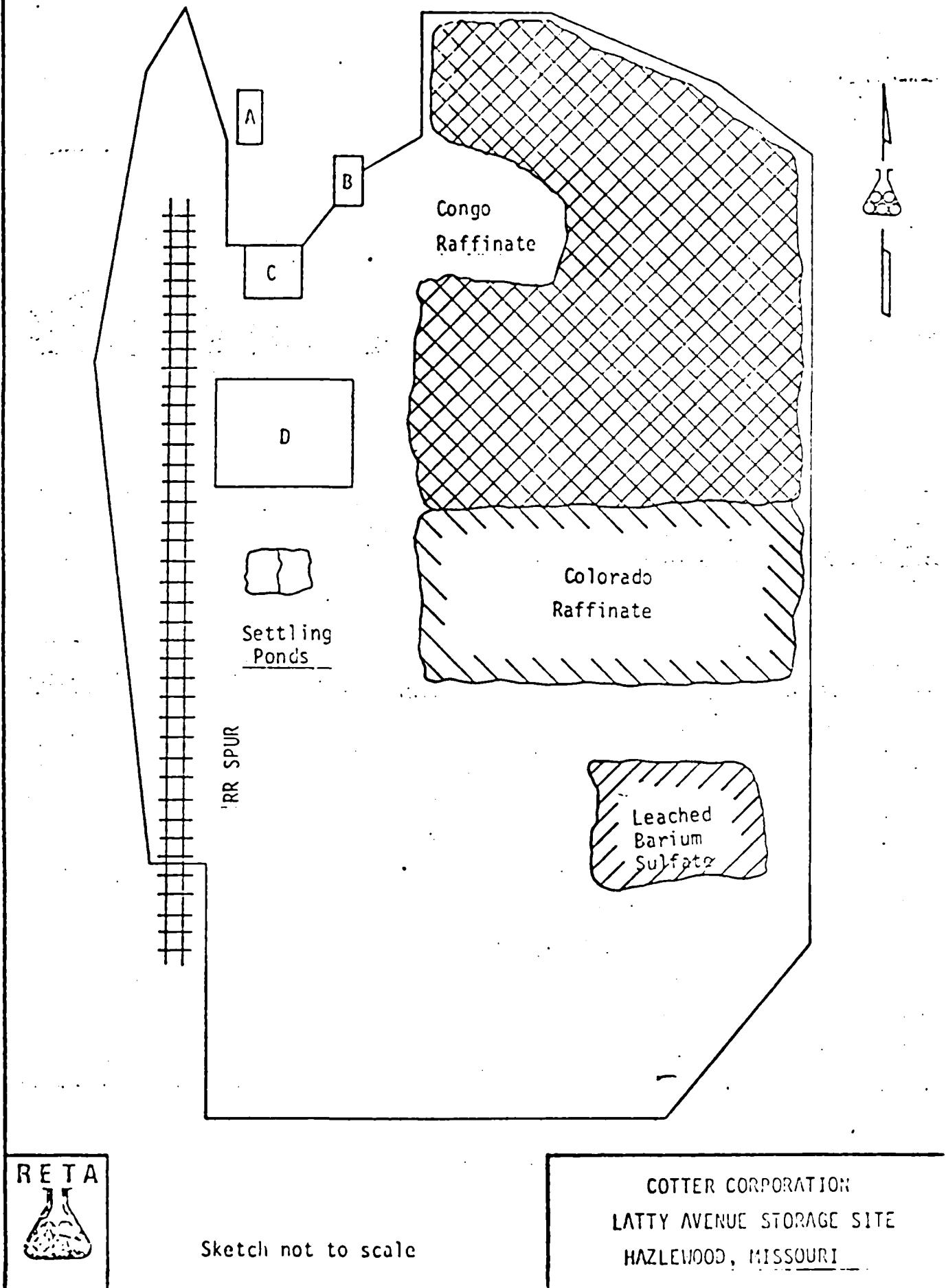
Very truly yours,

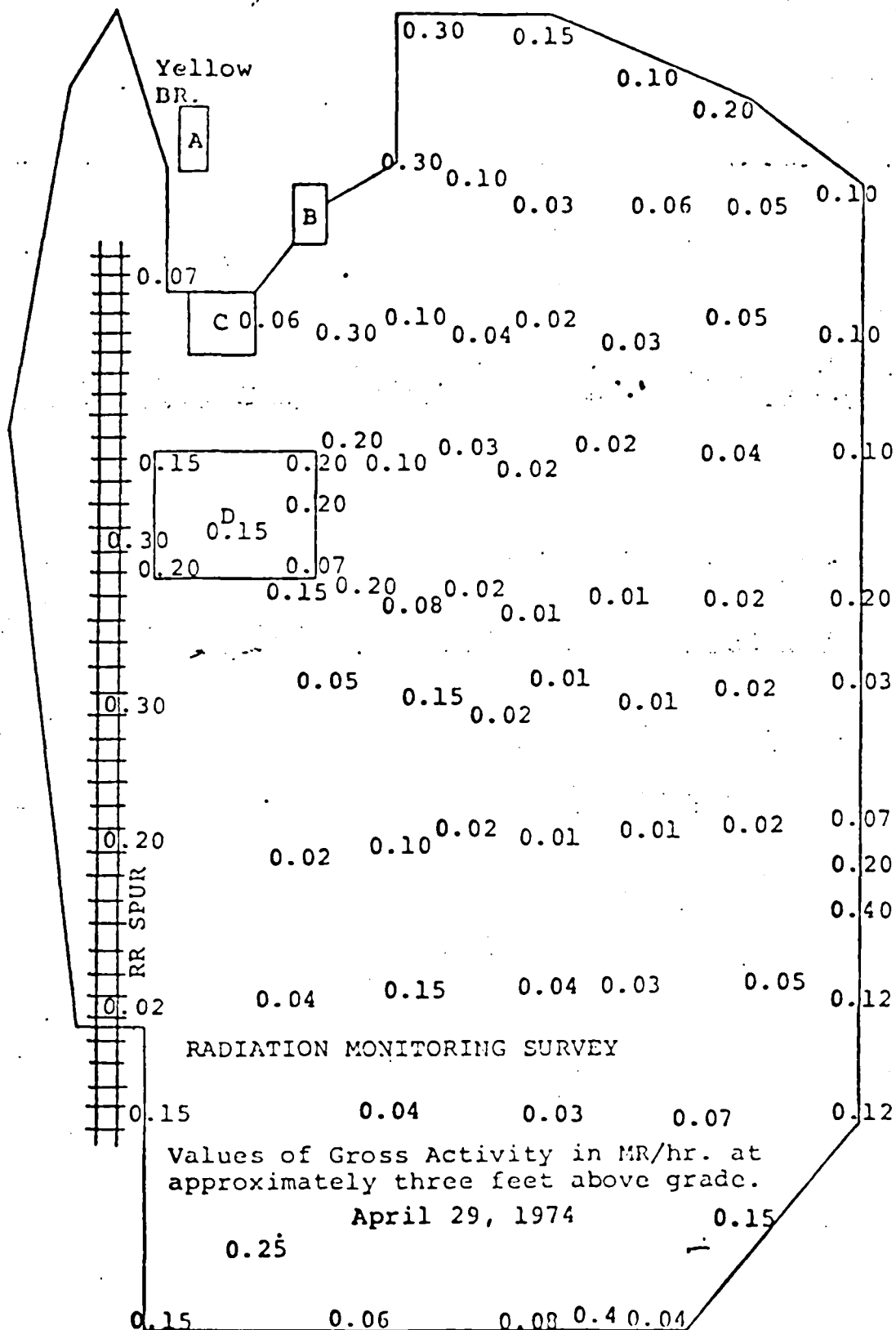
Phillip K. Feeney
Phillip K. Feeney, P.E.
Associate

Enclosures

PKF:pac

Offices
McLean,
Virginia
(Washington, D.
Dayton,
Ohio
Memphis,
Tennessee
Denver,
Colorado
Tampa,
Florida
New Orleans,
Louisiana
Arlington,
Texas
(Dallas-Ft. Worth)
Houston,
Texas
Casper,
Wyoming
Chicago,
Illinois
Northumbria
England
Rome,
Italy





RETA



Sketch not to scale.

COTTER CORPORATION
LATTY AVENUE STORAGE SITE
HAZLEWOOD, MISSOURI



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

NOV 1 1974

Cotter Corporation
ATTN: Mr. David P. Marcott
Executive Vice President
P. O. Box 256
Golden, Colorado 80401

Gentlemen:

This refers to the inspection conducted by Mr. W. D. Grant of our Region III Office on April 19 and 24, 1974, at your Hanford, Missouri site and on April 23, 1974, at your Canon City, Colorado Office of activities authorized by AEC Source Material License No. SM-102. Reference is also made to the discussions of our findings with you by Mr. Grant on April 26, 1974.

The inspection was an examination of the decommissioning operations at the Hanford, Missouri site and consisted of interviews with personnel of H-K Construction Company; consultants of Wynton, Edney, Tealinger and Associates; and, an examination of records at the Canon City, Colorado Office.

The inspection findings showed that during the period of July - October 1973, about 8700 tons of leached barium sulfate containing about 5 tons or averaging about 0.001 natural uranium was scooped up for disposal with approximately 39,000 tons of soil, and the resulting uranium concentration was about .0001%. It is our understanding from your contractor that the material was then deposited under about 100 feet of refuse and earth at St. Louis, Missouri County sanitary landfill area No. 1.

The disposal does not appear to be within the intent of the Commission's regulation, 10 CFR Part 40, to allow alteration of the physical nature of Source material (i.e. dilution of solids with nonradioactive source material) in order to obtain a physical mixture which would no longer be subjected to licensing by the Commission.

Exhibit E
1 of 2

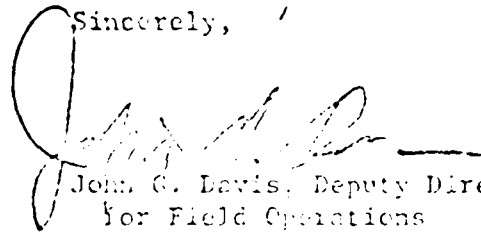
Cotter Corporation

-2-

NOV 1 1974

We have been advised that the Directorate of Licensing is in receipt of your request for license termination, which included the results of the radiation surveys performed at the Hazelwood site. You will receive separate correspondence concerning that request from the Directorate of Licensing.

Sincerely,

A handwritten signature in dark ink, appearing to read "John G. Davis", is written over a horizontal line.

John G. Davis, Deputy Director
for Field Operations
Directorate of Regulatory Operations

40-8035

LAW OFFICES

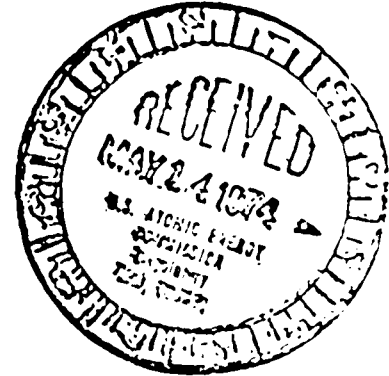
EDWARD J. McGRATH

201 NORTH FREDERICK AVENUE

GAITHERSBURG, MARYLAND 20760

(301) 948-2480

May 10, 1974



40-8035
W. Burkhardt, Senior Chemical Engineer
Fuels Fabrication & Reprocessing Branch
Licensing, Regulatory
Room 435, East-West Towers
UNITED STATES ATOMIC ENERGY COMMISSION
Washington, D. C. 20545

Re: Cotter Corporation, Source Materials License No. SUB-1022

Dear Mr. Burkhardt:

We enclose four copies of the Certification of Status with respect to the source materials license of Cotter Corporation and constituting notification that the corporation no longer possesses any radioactive material subject to United States Atomic Energy Commission licensing requirements.

Submitted in connection with the certification is a letter from Phillip K. Feeney, P.E., of the firm of Ryckman, Edgerley, Tomlinson & Associates, Inc., consulting environmental engineers, to which are attached plats of the Latty Avenue storage site where the licensed material formerly held by Cotter Corporation was deposited. The plat which we have marked "Attachment A" indicates the locations of the buildings and of the materials which were stored on the site. The plat which we have marked "Attachment B" contains the results of a radiological survey conducted by Ryckman, Edgerley, Tomlinson & Associates, Inc. subsequent to removal of all materials stored on the site.


Based upon the work performed by Cotter Corporation, the work of contractors hired by Cotter Corporation in connection with removal and cleanup, and upon the monitoring of Ryckman, Edgerley, Tomlinson & Associates, Inc., we are of the opinion that the Latty Avenue storage site and all appurtenances have been decontaminated. Cotter Corporation has removed to its mill in Colorado all materials with radioactivity levels meeting or exceeding that which subjects holders to license requirements.

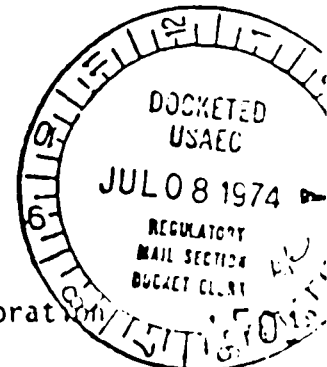
Since all source materials now owned or held by Cotter Corporation are situated in Colorado, and subject to the license issued to the corporation by the State of Colorado, we request at this time that the United States Atomic Energy Commission source materials license issued to Cotter Corporation be terminated.

Please contact me should you wish further information.

Reference 1 (4 pages)

Sincerely yours,


Edward J. McGrath
Attorney for Cotter Corporation



EJMcG/jmc
Copy to: David P. Marcott
Cotter Corporation

CERTIFICATION OF STATUS OF SOURCE MATERIAL ACTIVITIES
UNITED STATES ATOMIC ENERGY COMMISSION

LICENSE NUMBER
SUB-1022

LICENSEE: Cotter Corporation

ADDRESS: P. O. Box 352, 11011 W. 6th Avenue, Suite 302, Lakewood, Colorado

The licensee and any individual executing this certification on behalf of the licensee certify that (check appropriate item(s) below):

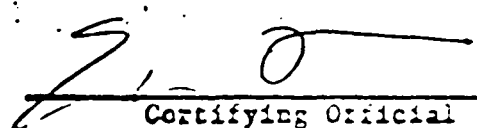
☐ No source materials have been procured and/or possessed by licensee.

☒ All source materials procured and/or possessed by licensee under Source Material License No. _____

☐ (1) have or will be prior to expiration of the above license transferred to _____
(Institution, firm, hospital, person, etc.)

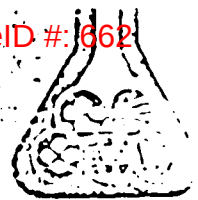
_____ which has Source Material License No. _____

☒ (2) have been or will be disposed of in compliance with 10 CFR 20 prior to expiration of this license.



Certifying Official
EDWARD J. McGRATH, Attorney for Cotter Corporation
Date: May 9, 1974

Please return 4 copies to:
U. S. Atomic Energy Commission
Materials Branch, Directorate of
Licensing
Washington, D. C. 20545



Yckman/Edgerley/Tomlinson & Associates, Inc.

May 1, 1974
RETA-780

Mr. David P. Marcott
Executive Vice President
Cotter Corporation
Post Office Box 352
Golden, Colorado 80401

Dear Dave:

Attached are two (2) sketches of the Latty Avenue Storage Site. The first depicts the original placement of the residues and buildings. Building "D" was the only building used for the actual drying operation.

The second sketch shows level of activity (MR/hr.) on April 29, 1974, after decontamination had been completed. As you can see, all of the locations fall below the allowable 0.6 MR/hr. (approximately 2,000 counts per minute) level.

If you have any questions or comments, or require additional information, please contact me.

Very truly yours,

Phillip K. Feeney
Phillip K. Feeney, P.E.
Associate

Enclosures

PKF:pac

Offices:
McLean
Virginia
(Washington, D. C.
Dayton,
Ohio
Memphis,
Tennessee
Denver,
Colorado
Tampa,
Florida
New Orleans,
Louisiana
Arlington,
Texas
(Dallas-Ft. Worth
Houston,
Texas
Casper,
Wyoming
Chicago,
Illinois
Northumberland,
England
Rome,
Italy

Yellow
BR.

A

B

C

D

RR SPUR

RADIATION MONITORING SURVEY

Values of Gross Activity in MR/hr. at
approximately three feet above grade.

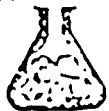
April 29, 1974

0.25

0.15

0.15 0.06 0.08 0.4 0.04

RETA



Sketch not to scale.

COTTER CORPORATION
LATTY AVENUE STORAGE SITE
HAZLEWOOD, MISSOURI

NOV 13 1974

DISTRIBUTION:

PDR

LPDR

State Health Official

L:FM R/F

L:FFRB#1 R/F

LCRouse

WTCrow

HWerner

ACabell

BBrooks

RO:HQ (2)

LNUnderwood

RGPage

L:FFRS:WTC

40-8035

SUB-1022

Cotter Corporation

ATTN: Mr. David P. Marcott

Executive Vice President

P. O. Box 365

Golden, Colorado 80401

Gentlemen:

In accordance with your application dated May 10, 1974 and pursuant to Title 10, Code of Federal Regulations, Part 40, Source Material License No. SUB-1022, is hereby terminated.

FOR THE ATOMIC ENERGY COMMISSION

Originals only

Identified

L. C. Rouse, Chief

Fuel Fabrication and Reprocessing

Branch No. 1

Directorate of Licensing

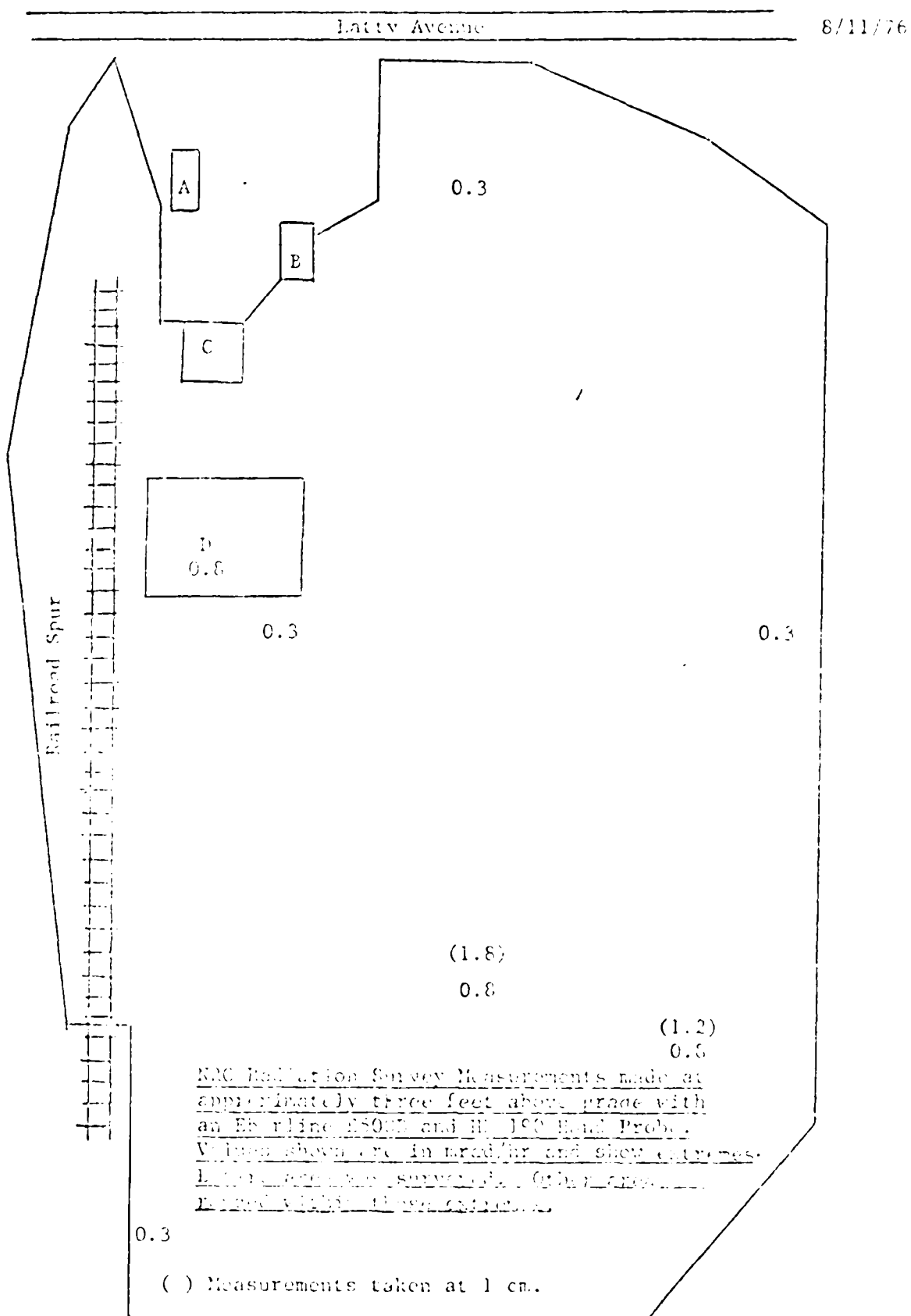
cc: Law Offices

Edward J. McGrath

201 North Frederick Avenue

Gaithersburg, Maryland 20760

Reference 2 (1 page)



Cotter Corporation
Latty Avenue Storage Site
Hazelwood, Missouri

(Not to exact scale)

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT

PRIOR TO RELEASE FOR UNRESTRICTED USE

OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE, OR SPECIAL NUCLEAR MATERIAL

U. S. Atomic Energy Commission
Directorate of Licensing
Materials Branch
Washington, D.C. 20545

December, 1973

Reference 4 (4 pages)

The instructions in this guide in conjunction with Tables I and II specify the radioactivity and radiation exposure rate limits which should be used in accomplishing the decontamination and survey of surfaces of premises and equipment prior to abandonment or release for unrestricted use. The limits in Tables I and II do not apply to premises, equipment, or scrap containing induced radioactivity for which the radiological considerations pertinent to their use may be different. The release of such facilities or items from regulatory control will be considered on a case-by-case basis.

1. The licensee shall make a reasonable effort to eliminate residual contamination.
2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Tables I or II prior to applying the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.
3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces of premises, equipment, or scrap which are likely to be contaminated but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement shall be presumed to be contaminated in excess of the limits.
4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to, special circumstances such as razing of buildings, transfer of premises to another organization continuing work with radioactive materials, or conversion of facilities to a long-term storage or standby status. Such requests must:
 - a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature, extent, and degree of residual surface contamination.
 - b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

- 2 -

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Tables I or II. A copy of the survey report shall be filed with the Director, Materials Branch, Directorate of Licensing, USAEC, Washington, D.C. 20545, and also the Director of the Regional Office of the Directorate of Regulatory Operations, USAEC, having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. The survey report shall:

- a. Identify the premises.
- b. Show that reasonable effort has been made to eliminate residual contamination.
- c. Describe the scope of the survey and general procedures followed.
- d. State the findings of the survey in units specified in the instruction.

Following review of the report, the AEC will consider visiting the facilities to confirm the survey.

SURFACE CONTAMINATION LEVELS⁽¹⁾

ISOTOPE ⁽²⁾	TOTAL ⁽³⁾	TABLE I		TABLE II	
		REMOVABLE ⁽³⁾⁽⁴⁾		TOTAL ⁽³⁾	REMOVABLE ⁽³⁾⁽⁴⁾
U-nat, U-235, U-238, Th-nat, Th-232, and associated decay products	10,000 dpm α /100 cm ²	1,000 dpm α /100 cm ²		<u>Average</u> ⁽⁶⁾ 5,000 dpm α /100 cm ²	1,000 dpm α /100 cm ²
				<u>Maximum</u> 25,000 dpm α /100 cm ²	
Other isotopes which decay by alpha emission or by spontaneous fission	1,000 dpm α /100 cm ²	100 dpm α /100 cm ²		<u>Average</u> ⁽⁶⁾ 500 dpm α /100 cm ²	100 dpm α /100 cm ²
				<u>Maximum</u> 2,500 dpm α /100 cm ²	
Beta-gamma emitters (iso- topes with decay modes other than alpha emission or spontaneous fission)	0.4 mrad/hr at 1 cm ⁽⁵⁾	1,000 dpm β - γ /100 cm ²		<u>Average</u> ⁽⁶⁾ 0.2 mrad/hr at 1 cm ⁽⁵⁾	1,000 dpm β - γ /100 cm ²
				<u>Maximum</u> 1.0 mrad/hr at 1 cm ⁽⁵⁾	

- (1) Either Table I or Table II may be used. For example, if all beta-gamma readings were less than 0.4 mrad/hr at 1 cm, Table I could be used; but if the maximum reading were 0.8 mrad/hr, material could be released under Table II providing the average was less than 0.2 mrad/hr.
- (2) Where surface contamination by both alpha and beta-gamma emitting isotopes exists, the limits established for alpha and beta-gamma emitting isotopes shall apply independently.
- (3) As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector and count rate meter for background, efficiency, and geometric factors associated with the instrumentation.
- (4) The amount of removable radioactive material per 100 cm² of surface area shall be determined by wiping that area with dry filter or soft absorbent paper and with the application of moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. In determining removable contamination on objects of lesser surface area, the pertinent levels shall be reduced proportionally, and the entire surface shall be wiped.
- (5) Measured through not more than 7 milligrams per square centimeter of total absorber.
- (6) Measurements of total contaminant shall not be averaged over more than 10 square meters. For objects of lesser surface area, the average shall be derived for each such object.